as follows :—The two ribbons, about a foot long, are both side by side on the table, held at one end between the finger and thumb, and then electrified by drawing along them several times a piece of indiarubber. They are then lifted up from the table, when, if care has been taken that all is warm and dry, they are found no longer to hang straight down side by side, but to stand out and repel each other.

To obtain an electric *spark* requires preparations on a larger scale. M. Tissandier recommends the following method :—A piece of stout drawing-paper (warm and dry, of course) is laid upon a table—or upon a warm dry board. It is then rubbed with the dry hand, or with a silk handkerchief, or with a clothes-brush, or, best of all, with a piece of indiarubber. It will stick slightly to the table in consequence of its electrification. Now throw down on to it a bunch of keys, and grasping two corners lift up the sheet from the table. If at the very moment of lifting any one holds out his knuckle to the keys he will receive a small pale spark perhaps three-quarters of an inch long.

A more certain way we have found with what we may call a *Tea-tray Electrophorus* (Fig. 17). A common tea-tray of metal is supported on two dry glass tumblers. A piece of common brown paper cut so as to be a little smaller than the tray, and with rounded corners, is warmed, laid on the table and rubbed briskly with a piece of indiarubber, or with a clothes-brush. It is then laid down for an instant on the tray and the tray is touched with the hand. The brown paper is then lifted a few inches above the tray. If at this juncture some person presents his knuckle to the tray he will receive a bright spark, which under favourable circumstances may be a couple of inches long. By simply putting the paper down, touching the tray, and again lifting up the paper the tray is again charged : and a large number of sparks may be thus drawn one after the other in rapid succession. The paper may be lifted by the hands, but it will be found better if a couple of ribbons or strips of paper be fixed on with wax to serve as handles, as shown in our figure.

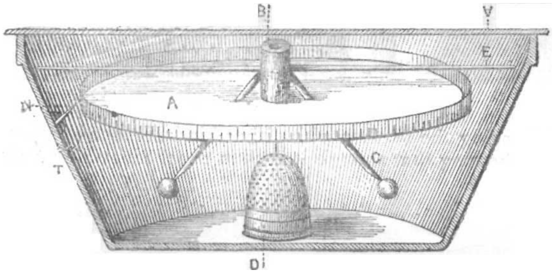

Fig. 19.

The sparks obtained by the tea-tray electrophorus may produce a slight pricking sensation, but to give a regular electric *shock* will oblige us to store up a charge in a Leyden jar. This important piece of apparatus we have found possible to improvise in the following fashion. A round-bottomed glass tumbler is procured—if of thin glass it is preferable—and is filled to about three-quarters of its height with leaden shot. If shot is not at hand *dry* coal-dust will answer, but not so well, and great care must be taken to wipe clean the upper part of the tumbler. Everything must be warm and scrupulously dry. Into the shot a silver spoon is stuck to serve the place of a rod and knob. This is held as shown in Fig. 18, by grasping it well in the hollow of the hand, so that the hand may cover the whole of the rounded bottom of the glass. Having thus prepared and grasped our Leyden jar we must charge it with sparks from the tea-tray electrophorus. It should be held with the spoon handle near to, but not quite touching the edge of the tea-tray, while another person performs the operations of lifting the brown paper up and putting it down, then touching the tray, then lifting up again—and so on until a dozen sparks have been sent into the jar. On touching the knob a smart little shock is experienced in the wrists and elbows, and a short bright snapping spark announces the discharge of the jar.

The subject of currents of voltaic electricity is somewhat beyond the province of "Physics without Apparatus," and so is the greater part of the subject of magnetism. We may however conclude this article by presenting our readers with a simple mariners' compass described some time ago in a French magazine (Fig. 19). A short knitting- or darning-needle, E, which has been magnetised by rubbing it on a magnet, is pushed into a small cork, B, and balanced in the following way :—A sewing-needle is fixed, point downwards, in the lower end of the cork, and this is poised on a sewing-thimble. To balance it about the point of the needle a couple of matches pointed at the ends are thrust into the sides of the cork obliquely, and weighted at their lower ends with little balls of sealing-wax. A circle of paper or thin card marked with the "points" of the compass may be attached to the cork; and to prevent draughts of air from blowing the needle round it should be placed in a deep saucer or dish of glass or porcelain.

(*To be continued.*)

NOTES

We are glad to be able to state that Mrs. Clifford is to receive a pension from the Civil List in recognition of the eminent services to mathematics of her husband, the late Prof. W. K. Clifford, F.R.S.

In the absence of precise information as to the cause of the lamentable explosion at Seaham Colliery, we cannot say anything useful on the occurrence. When such terrible "accidents" occur, Science is invariably asked if she cannot do anything to prevent them, anything to render the miner's occupation less dangerous than it is. Those who ask such questions seem to be ignorant of the fact that, while much remains to be done, science has already done not a little to point out the causes of such explosions and provide the miners with remedies. But it is well known that a large proportion of such explosions are due to the wilful neglect on the part of the miners of the means which science has put into their hands to prevent such calamities. We are in a fair way of finding out the real nature of the connection between meteorological conditions and explosions in mines; it is in this direction that investigations should be carried out with thoroughness and zeal.

The Sir Josiah Mason's Science College, Birmingham, is to be opened on October 1 next, with an introductory lecture by Prof. Huxley. The classes for students will commence on Tuesday, the 5th. The course of instruction, as at present arranged, includes mathematics, chemistry, physics, and biology. Further details may be learned from our advertising columns.

Two eminent foreign botanists will, the *Gardener's Chronicle* states, shortly visit this country—Dr. Asa Gray and M. Alphonse de Candolle.

We are glad to learn that the Gilchrist Trustees have given two engineering scholarships to University College, London, to be awarded by competition. There is an entrance scholarship (this year two are offered) of the value of 35*l.*, tenable for two years, to be competed for by those who have not previously been students of the College, and who are not more than eighteen years of age. The examination takes place this year on September 28, and candidates must send in their names to the secretary on or before the 23rd. The subjects of the entrance examinations will be as follows :—Mathematics, mechanics, mechanical drawing, essay on one of three given subjects connected with mechanics or engineering, French or German, the use of tools, either carpenters' tools, *or* the lathe (wood *or* metal), *or* the file. There is also a senior scholarship of the value of 80*l.* to be awarded at the close of each session from 1881-82 inclusive. Candidates for this scholarship must, to the satisfaction of the Faculty of Science, have attended during the whole of the session immediately preceding the award College classes in the following subjects:—Applied mathematics, practical physics, junior engineering, engineering drawing, geology. The scholarship will be awarded on the results of the ordinary class examinations in these subjects.

REFERRING to a short announcement in NATURE, vol. xxi. p. 306, of prizes offered by the Venetian Institute, we have been desired to point out that the limit of time for the first (that relating to the mechanical equivalent of heat) is March 31, 1881 (not 1880). In further explanation we may say that the task proposed is "to discuss minutely the determinations of the equivalent hitherto made, to investigate the causes of the considerable differences that have appeared in the results, to indicate what is the most probable value that may be deduced from these, and to determine the equivalent by new experiments, adopting the method which the competitor shall have proved to be most exact." Many writers of great authority assume 424 or 425 kilogrammetres as the mean value; but Joule's more recent experiments, based on observation of electric phenomena, give 430, and Violle has obtained a value approximating 435. The importance to physical science of a settlement of the question is obvious.

THE Vienna Academy (Section of Mathematics and Natural Science) has proposed as subject for the Baumgärtner prize of 1,000 florins the microscopic investigation of wood of living and fossil plants. By such investigation and the comparison of all known recent and fossil woods, it is desired to ascertain characters whereby it will be possible to determine the genus and species with certainty from microscopic sections. Papers must be sent in before December 31, 1882, and the prize will be awarded at the anniversary meeting in 1883. For further conditions see the *Anzeiger*.

THE *Philadelphia Record* deserves all the credit that has been accorded it for its public-spirited and successful efforts to break up the sale of bogus medical diplomas in that city. These diplomas were chiefly sold abroad, and it is appalling to learn, on the authority of the *Times* correspondent, that 11,000 of them have been issued during the past few years. "It was well known," the correspondent writes, "that Dr. John Buchanan, the Dean of 'The American University of Philadelphia,' and several other similar institutions, was engaged in this traffic; but as they were all properly chartered medical schools, and, though disreputable, existing under the sanction of law, the difficulty was to get evidence of the sale of the diplomas. Diplomatic complaints about the traffic came from various Governments of Europe, and our people began to be restive under the stigma." By the clever tact of the city editor of the *Record*, however, Buchanan has been brought within reach of the law, and the detectives are on his track. He attempted to put them off the scent by getting a man looking like himself to pretend to drown himself; this bogus case of drowning, however, has deceived nobody.

MR. A. L. SILER, the *American Naturalist* informs us, has discovered at Malley's Nipple Ranch, near Pahreah, Kane county, Utah, remains of cliff-structures, which he describes as follows:—The remains seem to have been the foundations of small huts built on ledges of red sandstone under overhanging cliffs. The walls were about six inches thick, made of thin flat sandstone brought up from the valley below, and laid in adobe. The structures are divided into rooms about four feet square, leaving all the space between the building and the back of the cliff, usually about ten feet, entirely free. Upon digging into one of the rooms, Mr. Siler found parched corn and rope in a good state of preservation.

THE August number of the *American Entomologist* contains an interesting article by the editor (Prof. C. V. Riley) on the effects of *Pyrethrum* (either as powder or fumes) on injurious insects, and the author believes this otherwise harmless substance is destined to entirely supersede the use of Paris green and other arsenical compounds. Experiments were made upon various insects, and on some the effect was remarkably rapid, the powder killing them in a very short time. "Squash bugs" appeared to resist the longest. Amongst other articles and notes is one on a luminous elaterid larva from Maryland, accompanied by figures; and an important one by Prof. W. S. Barnard on the larva of a *Simulium*, which forms black masses on the rocks in rapids near Ithaca, N.Y., the pupa being furnished with external breathing apparatus. This magazine still suffers from the inconvenient absence of any indication of the contents of each number, a want the editors will do well to supply.

THE members of the Geological Society of France arrived at Boulogne on Thursday last. At their reception in the Collége Communal, adjoining the museum, a *vin d'honneur* was offered them by the municipality. Among those present were Professors Prestwich and Seeley. The first meeting took place in the Salle Daunou, at the museum, where an opening address was delivered by M. de Lapparent, president of the Society.

ON August 18 and 24 storms of almost unprecedented violence swept over Kingston, Jamaica, and its neighbourhood. The destruction has been widespread and terrible, reminding one of the dire effects sometimes experienced from storms at Mauritius.

PROF. SILVESTRI, in a recent ascent of Etna, found that, as a result of recent volcanic activity, the summit has been lowered to the extent of 12 metres, so that its present height above sea-level is 3,300 metres, and that the interior edge of the crater, which was formerly 1,500 metres in circumference, is now 1,800. The platform which was formerly seen on the east side, at 60 metres below the edge of the crater, has completely fallen into the heart of the volcano, and the eruptive axis, which before the eruption of 1879 was situated on the west side of the crater, is now right in the centre. Thus the interior walls of the crater of Etna now present the virtually characteristic form of a great funnel.

ON September 5 the adherents of the Positive Philosophy went in procession to the Père Lachaise to the tomb of Auguste Comte, the founder of this system. Their number was about 200. Three speeches were pronounced on the spot, and in the evening a banquet took place in the very rooms that Auguste Comte occupied during his lifetime and which have been preserved in their former state.

TRACES of the last exceptionally cold winter are now visible in Paris, a large number of trees in the squares and streets having lost their foliage at an early period. Many of them are showing leaves belonging to a second formation, and which are probably doomed to a speedy death. We daresay many of our readers will have noticed a similar result in London.

ACCORDING to the *Révue Scientifique* a change has taken place in the Observatory of Algiers, but of a very unusual character. M. Balard, who has been during so many years director of this establishment, has been reduced to the grade of astronomical *attaché*, and M. Trepied, adjoint member of the Bureau des Longitudes, and one of the staff of the *Révue Scientifique*, has been appointed director.

Monsignor Eligio Cosi, Bishop *in partibus infidelium* at Chang-Tong in China, is said to have invented a new alphabet, composed of thirty-three letters, with which all sounds of the Chinese tongue can be clearly expressed; until now 30,000 were requisite. The Emperor of Austria, to whom Monsignor Cosi communicated his invention, presented him with a complete typographical apparatus for a printing establishment.

The boring of the Arlberg Tunnel is in active progress on the Austrian side of the mountain, and ground will shortly be broken on the Swiss side. The St. Gothard line in its entire length is expected to be in running order in April next.

A rather smart earthquake shock was felt at Zermatt on the 3rd inst., and other two on Friday last.

On Wednesday, September 8, lightning fell on the Sorbonne at about half-past two o'clock. A globe of fire was observed by persons present on the spot. Some of them say it was seen coming from the point of the north-western conductor, which was struck, as well as the south-western, with a great noise. The Sorbonne had, until recently, no lightning conductor, and never, as far as is known, has any thunderbolt struck the venerable abode of the French University. But within the last few months six stems have been erected and connected by an iron bar, making a circuit which goes all over the roof of the immense building. Unfortunately the pit where the earth conductor has been placed is situated at a great distance from the main building, in a courtyard adjoining the laboratory of M. Jamin, and the conductor which connects the roof with this is a square iron box of less than 15 mm. on each side, so that there is not sufficient conductibility in it to establish an efficient connection with the earth. This accident proves the sagacity of M. Karsten, the Schleswig Holstein physicist, who published a table giving a formula for regulating the dimensions of the connecting-rods with their lengths, as is taught by Ohm's laws. It shows also how little the knowledge of lightning-conductors is spread in France, in spite of the several official commissions which have been established by the Government.

During the severe thunderstorm which passed over North London on Monday, a peculiar phenomenon was witnessed in the grounds of the Welsh Harp, Hendon, by some gentlemen boating on the lake. A vivid flash of lightning was succeeded by a tremendous peal of thunder, a great ball of fire at the same time descending from the heavens into the water. When the storm had abated over 100 fish of various kinds, including two fine carp, weighing together 23 lb., were found floating dead on the lake.

The elevation of temperature which has been so remarkable in Paris during the end of August and the beginning of September has been accompanied by the production of a putrid odour spread all over the city, and which has been obnoxious to the public health. A report has just been published by the Prefect of Police, explaining that it must be attributed to the want of water for flushing the sewers, and also to the existence of a number of establishments where sulphate of ammonia is produced, and matters extracted by night-men are dried to be turned into manure. The Prefect of Police says that measures will be taken for producing an enlarged supply of water, and that gradually all the sewage will be conducted to Clichy by the sewers. The completion of this scheme involves the purchase by the city of a large tract of land for utilising these matters, which could not be thrown into the Seine without poisoning the stream.

The *Daily News* Naples correspondent writes that since the 4th instant Vesuvius has again become more active, and has launched his projectiles in greater number and to a greater height. The seismograph at the observatory is also more animated, and new lava has issued from the side of the cone, flowing, fortunately for the railway, to the north east.

The new number of the *Canadian Naturalist* (which, we believe, is kept up with difficulty) contains a paper by Mr. G. M. Dawson on the Distribution of the more Important Trees of British Columbia, which has also been printed separately, and another by Principal Dawson, on the Geological Relations and Fossil Remains of the Silurian Ores of Pictou, Nova Scotia. Mr. G. F. Matthew has a paper on Tidal Erosion in the Bay of Fundy. Are such specimens of etymological jugglery as the Rev. J. Campbell's paper on the "Hittites in America" supposed in Canada to have any connection with science? Unfortunately some of our own scientific societies are guilty of encouraging similar elaborate trifling.

Further excavations, the *Times* Geneva correspondent states, made in the ancient glacier bed near Solothurn have produced some very interesting results, and the spot is being daily visited by geologists and sightseers. The *débris* removed consisted of $4\frac{1}{2}$ metres of drift mixed up with boulders and crystalline erratic blocks. The rock bared measures 20 metres long by 7 wide. It is highly polished by the action of the ice, and traversed by channels, through which the glacier-water found its way into the so-called "giants' pots," or "kettles." These, so far as has yet been ascertained, are three in number. The largest measures 8 metres from west to east, 3·7 from north to south, and is $3\frac{1}{2}$ metres deep. The second is $5\frac{1}{2}$ metres across, and still contains the great boulder or mill-stone by which it was hollowed out. The third is smaller and oval-shaped, and there is reason to suppose that, if the excavations were continued, several more would be brought to light. This interesting relic of the great ice-age, or rather of the last glacial epoch, is at present private property, but a project is on foot for its acquisition by the canton, and preservation as a glacier garden in the manner of that of Lucerne.

We have on our table the following publications:—"Familiar Wild Flowers," by F. E. Hulme (Cassell); "On the Educational Treatment of Incurably Deaf Children," by W. B. Dalby (Churchill); "Brain and Nerve Exhaustion," by Mr. Stretch Dowse (Baillière); "Lectures on the Science and Art of Education," by Joseph Payne (Longmans); "The Morals of Evolution," by M. J. Savage (Trübner); "Animal Magnetism," by R. Heidenhain (Kegan Paul); "Stonehenge Plans, Descriptions, and Theories," by W. M. F. Petrie (E. Stanford); "Ambulance Lectures," by Lionel A. Weatherly, M.P. (Griffith and Farren); "Astronomy, Text-Books of Science," by R. S. Ball (Longmans); "The Land and Freshwater Shells of the British Isles," by R. Rimmer (Bogue); "British Wild Flowers by Natural Analysis," by J. Messer (Bogue); "Glimpses of England," by J. R. Blakiston (Griffith and Farran); "Radical Mechanics of Animal Locomotion," by Mr. Wainwright (Van Nostrand).

The additions to the Zoological Society's Gardens during the past week include a Common Cuckoo (*Cuculus canorus*), European, presented by Mr. G. Chandle; a Stock Dove (*Columba œnas*), European, presented by Mr. A. Basil Brooke; a Common Raven (*Corvus corax*), European, presented by Mr. W. A. Mitchison; a Rufescent Snake (*Leptodira rufescens*) from South Africa, presented by the Rev. G. H. R. Fiske, C.M.Z.S.; a Horned Lizard (*Phrynosoma cornutum*) from Texas, presented by Mrs. Budgett; a Vervet Monkey (*Cercopithecus lalandii*) from South Africa, two Bull Frogs (*Rana mugiens*) from Nova Scotia, deposited.

OUR ASTRONOMICAL COLUMN

Faye's Comet.—The following places of this comet are adapted, like those previously given in this column, to Berlin midnight or to about 11h. Greenwich time:—